Analysis and Research on University Information Technology Course Examination Based on Different Majors

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Abstract: To analyze the final examination scores in university information technology course for 165 students from four different majors at Shanghai Jian Qiao University in the cohort of 2023.The aim is to understand the differences in learning outcomes among students from different majors in this course. This research is intended to provide a solid reference for subsequent computer basic education work, by optimizing teaching content and methods, it will more precisely meet the learning needs of students from different majors, and thereby promote the development of computer basic education to a higher level.

1. Introduction

Currently, the rapidly evolving information technology has brought disruptive changes to the progress of society and human life, playing an increasingly important role in people's daily learning, work, and life. The "Outline of the National Long-term Education Reform and Development Plan" points out that "information technology should be integrated with education to accelerate the process of educational development." "University Information Technology" as a compulsory course for freshmen, is an important way for students to master basic knowledge and computer skills[1]. At the same time, the integration and development of various fields with information technology have produced a great integration effect and development space, which puts forward new requirements for computer basic education[2].

This study analyzes the final exam scores of the "University Information Technology" course for students majoring in Business Administration, Secretarial Studies, Journalism, and Health Services in the 2023 cohort at Shanghai Jian Qiao University. The aim is to explore the differences in learning outcomes across various majors, and to make targeted adjustments and optimizations in the teaching of university information technology in the future. This will ensure that high-quality computer basic education services are provided to students from different majors.

2. Objects and Methods

2.1. Objects

The study selected the final exam scores of the "University Information Technology" course for students majoring in Business Administration, Secretary Science, Journalism, and Health Services from the 2023 cohort at Shanghai Jian Qiao University for analysis, with a total of 165 students involved.

2.2. Methods

2.2.1. Distribution of Question Types on the Examination Paper

As shown in Table 1,the examination paper is scored out of 100 points and mainly includes

multiple-choice questions (30 points), fill-in-the-blank questions (5 points), data file management (5 points), Excel (30 points), and PowerPoint (30 points). A passing score for the examination paper is 60 points, and the passing score for each type of question is also 60% of its total score.

Table 1 Distribution of Examination Paper Question Types

Serial Number	Question Type	Number of Questions	Score	Value Distribution
1	Multiple-choice Questions	30	30	30%
2	Fill-in-the-blank Questions	5	5	5%
3	Data File Management	1	5	5%
4	Excel	1	30	30%
5	PowerPoint	1	30	30%

2.2.2. Statistical Analysis Methods

This study utilized EXCEL for data entry and SPSS 21.0 statistical software for analysis and comprehensively analyzes the exam scores of the "University Information Technology" course for students from four different majors. Descriptive statistical analysis was conducted on the scores for each type of question using mean values and standard deviations. Variance analysis was used to compare the means of multiple groups, and the LSD method and Tamhane test were used for pairwise comparisons among multiple group means.

3. Results

3.1. Overall Examination Performance of Students

As can be seen from Table 2, among the 165 students, 142 passed the exam, resulting in a pass rate of 86.1%. The average score of the overall results is 72.9 ± 12.3 points. Among them, the pass rate for fill-in-the-blank questions is the lowest (27.3%), while the pass rate for data file management questions is the highest (99.4%).

Table 2 Overall Examination Performance of Students

Serial Number	Question Type	Score ($\bar{x} \pm s$)	Passing Rate [n(%)]
1	Multiple-choice Questions	15.9±3.7	58(35.2)
2	Fill-in-the-blank Questions	1.5±1.4	45(27.3)
3	Data File Management	4.7±0.7	164(99.4)
4	Excel	24.5±5.3	146(88.5)
5	PowerPoint	26.2±6.1	153(92.7)
	Total Score	72.9±12.3	142(86.1)

3.2. Examination Performance from different majors

As can be seen from Table 3, among the total exam scores of students from different majors, the average scores for Business Administration, Secretarial Studies, Journalism, and Health Services were 64.2 ± 14.1 points, 71.4 ± 12.0 points, 79.2 ± 9.0 points, and 76.6 ± 7.4 points, respectively. The pass rates for the total exam scores of students from different majors were 65.9%, 82.9%, 97.6%, and 97.5%. In the scores of different question types among students from various majors, the average score for multiple-choice questions was highest for Journalism students (18.4 ± 2.7) and lowest for Business Administration students (14.2 ± 3.0). The average score for fill-in-the-blank questions was highest among Journalism students (3.0 ± 0.9), with Secretarial Studies students scoring the lowest (0.8 ± 1.2). The average score for data file management questions was highest among Journalism students (4.9 ± 0.6), with Business Administration students scoring the lowest (4.4 ± 0.9). The average score for Excel questions was highest among Health Services students (26.0 ± 3.7), with Business Administration students scoring the lowest (22.5 ± 5.7). The average score for PowerPoint questions was highest among Health Services students (28.2 ± 1.7), with Business Administration students scoring the lowest (23.4 ± 4.0).

Table 3 Examination Performance from different majors

Question Type	Business Administration (n=41)		Secretarial Studies (n=41)	
	Score ($\bar{x}\pm s$)	Passing Rate [n(%)]	Score ($\bar{x}\pm s$)	Passing Rate [n(%)]
Multiple-choice Questions	14.2±3.0	6(14.6)	14.7±4.0	11(26.8)
Fill-in-the-blank Questions	0.9±0.9	4(9.8)	0.8±1.2	5(12.2)
Data File Management	4.4±0.9	41(100)	4.8±0.5	41(100)
Excel	22.5±5.7	34(82.9)	24.5±6.1	36(87.8)
PowerPoint	22.3±8.8	32(78.0)	26.5±5.3	39(95.1)
Total Score	64.2±14.1	27(65.9)	71.4±12.0	34(82.9)
Question Type	Journalism (n=42)		Health Services (n=41)	
	Score ($\bar{x}\pm s$)	Passing Rate [n(%)]	Score ($\bar{x}\pm s$)	Passing Rate [n(%)]
Multiple-choice Questions	18.4±2.7	28(66.7)	16.5±3.6	13(31.7)
Fill-in-the-blank Questions	3.0±0.9	29(69.0)	1.1±1.2	5(12.2)
Data File Management	4.9±0.6	40(95.2)	4.8±0.6	41(100)
Excel	25.1±4.8	37(88.1)	26.0±3.7	39(95.1)
PowerPoint	27.9±4.7	41(97.6)	28.2±1.7	41(100)
Total Score	79.2±9.0	41(97.6)	76.6±7.4	40(97.5)

3.3. Difference Analysis of Examination Performance among Students from Different Majors

The Table 4 shows that variance analysis of the exam scores of students from different majors found that there are differences in the exam scores for multiple-choice questions (F=12.948, P<0.001) and Excel questions(F=3.405, P=0.019<0.05) among at least two majors.

Table 5 indicates that the Tamhane test on the exam scores of students from different majors revealed differences in the scores for fill-in-the-blank questions, data file management questions, PowerPoint questions, and total scores among at least two majors, all with P<0.05.

Table 4: Variance Analysis of Examination Scores among Students from Different Majors

Question Type	Business Administration(n=41)	Secretarial Studies(n=41)	Journalism(n=42)	Health Services(n=41)	F	P
Multiple-choice Questions	14.2±3.0	14.7±4.0	18.4±2.7	16.5±3.6	12.948	<0.001*
Excel	22.5±5.7	24.5±6.1	25.1±4.8	26.0±3.7	3.405	0.019*

Note: Pairwise comparison results show that for multiple-choice questions, there are differences between Business Administration vs Journalism, Health Services (P<0.05); Secretarial Studies vs Journalism, Health Services (P<0.05); and Journalism vs Health Services (P<0.05). For Excel questions, there are differences between Business Administration vs Journalism, Health Services (P<0.05).

Table 5: Tamhane Test on Examination Scores among Students from Different Majors

Question Type	Business Administration(n=41)	Secretarial Studies(n=41)	Journalism(n=42)	Health Servics(n=41)	Welch	P
Fill-in-the-blank Questions	0.9±0.9	0.8±1.2	3.0±0.9	1.1±1.2	50.200	0.001*
Data File Management	4.4±0.9	4.8±0.5	4.9±0.6	4.8±0.6	2.908	<0.001*
PowerPoint	22.3±8.8	26.5±5.3	27.9±4.7	28.2±1.7	6.684	<0.001*
Total Score	64.2±14.1	71.4±12.0	79.2±9.0	76.6±7.4	12.666	0.001*

Note: Pairwise comparison results indicate that for the total score, there are differences between Business Administration vs Journalism, Health Services (P<0.05); Secretarial Studies vs Journalism (P<0.05). For fill-in-the-blank questions, Journalism differs from Business Administration, Secretarial Studies, and Health Services (P<0.05). In data file management questions, Business Administration differs from Journalism (P<0.05). For PowerPoint questions, Business Administration differs from Journalism and Health Services (P<0.05).

4. Discussion

4.1. Analysis of the Pass Rate for Examination Scores Among All Students

The passing rate for the total scores of the 165 students in this study is 91.9%, fully reflecting that the students have a relatively ideal overall grasp of the knowledge. However, the passing rates for multiple-choice questions and fill-in-the-blank questions are relatively low, with 35.2% and 27.3% respectively, indicating that the students need to strengthen their mastery of specific question types. Additionally, the pass rates for other types of questions ranged from 86.1% to 99.4%. The lower

pass rates for multiple-choice and fill-in-the-blank questions may be attributed to their focus on testing foundational knowledge in information technology and computer basics. These questions require students to strengthen their memorization and continuous accumulation of relevant knowledge, enabling them to apply it proficiently during exams. Therefore, students should pay more attention to reviewing these question types to improve their pass rates. Data file management, Excel, and PowerPoint questions primarily assess students' practical skills. As students have undergone corresponding hands-on training for these types of questions in the classroom and they also have a keen interest in these operations, they are more likely to score highly in these areas. This further highlights the importance of practical operations in enhancing students' skills and comprehension abilities.

4.2. Examination Performance Analysis Among Students from Different Majors

The results show that Journalism students have the highest average total score and pass rate, indicating that they have a better overall grasp of the knowledge, which may be related to the characteristics of their major. Journalism students, whether in reporting, writing, or editing, need to use these fundamental skills. Additionally, computer basics courses can help students understand and master new media technologies, thereby expanding the channels for news dissemination. Therefore, Journalism students might have a greater interest in computer basics courses compared to other majors. Business Administration students have the lowest average total scores and pass rates, which may be related to the fact that most of them are liberal arts students. Liberal arts students tend to have study habits and learning methods that favor memorization and understanding, whereas computer basics courses emphasize logical thinking and practical operations. This difference in study habits and learning methods can make it difficult for liberal arts students to adapt to computer basics courses. Additionally, since liberal arts students typically engage with humanities knowledge at the high school level and have less mastery of computer basics and operational skills, some students from remote areas may even have never been exposed to computers, presenting significant challenges when studying computer basics courses.

5. Measures

5.1. Adjusting Teaching Content According to Major Characteristics

Based on the needs of different majors, teachers can customize the content of computer basics courses to highlight knowledge points and skills relevant to each field. For example, for students majoring in computer networks, it would be beneficial to include content on network protocols and network security; while for those in administrative majors, mastering the use of Word, Excel, and PowerPoint is crucial as these software applications are widely used in administrative management, office automation, document processing, report creation, and presentation communication.

5.2. Designing Classroom Practices with Professional Characteristics

For computer basics education, hands-on practice is a crucial component. Teachers should provide students with ample opportunities for practical work, allowing them to reinforce their knowledge through hands-on experience. For students from different majors, it is beneficial to design practice projects with professional characteristics to help them apply computer knowledge in their respective fields. For example, for students in accounting majors, mastering Excel operations is particularly important as it can help accountants collect and manage financial data scientifically and effectively, reduce the error rate in data processing, and enhance the accuracy and reliability of accounting work.

5.3. Focusing on Cultivating Computational Thinking Based on OBE Educational Philosophy

For students of any major, computational thinking is an important skill. Infusing the cultivation of computational thinking throughout university foundational courses can effectively establish and exercise students' systematic computational thinking abilities, laying the groundwork for future professional studies and career work. It also encourages students to apply computer knowledge

flexibly to solve practical problems, truly achieving the transition from knowledge to practical ability[3-4]. For instance, based on the OBE (Outcome-Based Education) philosophy, with the core mission of cultivating computational thinking abilities, OBE is an educational model centered on learning outcomes. It places students at the center and continuously improves, representing an advanced approach to learning that aims for competency achievement[5-6].

6. Conclusion

As various fields continue to develop and educational philosophies are continually updated, the methods and means of teaching computer basics also need to be continuously refreshed. Teachers should pay attention to the latest educational technologies and teaching concepts, attempting to apply new methods and tools in their instruction to enhance teaching effectiveness and students' interest in learning. For instance, leveraging generative artificial intelligence as an effective tool in computer basics education can offer students a more enriched and intuitive learning experience[7]. Hybrid teaching[8] provides greater flexibility and personalized learning opportunities for students. The flipped classroom[9] approach allows class time to be dedicated to the development of higher-order thinking and skills. Collaborative learning [10]cultivates students' ability to work collaboratively in groups.

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